

CLAIMS

1. A probe for a probe microscope using a transparent substrate, comprising: at least one cantilever which is made of a thin film and which is supported on one surface of the transparent substrate with a predetermined space therefrom, the transparent substrate being formed of a material transparent to visible light or near-infrared light and having an observation window function which enables optical observation and measurement while partitioning environments of the inside and the outside of a container, whereby the cantilever is optically observed or measured or is optically driven through the rear surface of the transparent substrate.
2. The probe for a probe microscope using a transparent substrate, according to Claim 1, wherein a microlens is formed as a part of the transparent substrate, the microlens allows light used for optical observation or measurement of the cantilever, or for optical driving thereof to converge on the rear surface of the cantilever.
3. The probe for a probe microscope using a transparent substrate, according to Claim 1, wherein the front surface of the transparent substrate is slightly inclined to the rear surface thereof in order to prevent the interference

between a light reflected on the front surface of the transparent substrate and a light reflected on the rear surface thereof.

4. The probe for a probe microscope using a transparent substrate, according to Claim 1, wherein the transparent substrate is also used as a quarter-wave plate.

5. The probe for a probe microscope using a transparent substrate, according to Claim 1, wherein the cantilever has an internal stress, whereby the space between the cantilever and the transparent substrate is gradually increased from a fixed portion of the cantilever toward the free end thereof.

6. A method for manufacturing a probe for a probe microscope using a transparent substrate, comprising the steps of

- (a) forming a cantilever from a single crystalline silicon thin film of a SOI substrate;
- (b) bonding the rear surface of the SOI substrate to a glass substrate; and
- (c) removing a handling wafer and a buried oxide film of the SOI substrate.

7. The method for manufacturing a probe for a probe

microscope using a transparent substrate, according to Claim 6, further comprising the step of forming a probe tip at the free end of the cantilever by wet etching.

8. A probe microscope device comprising: the probe for a probe microscope using a transparent substrate, according to one of Claims 1 to 5, wherein deformation or vibration property of the cantilever, which is caused by interaction with a sample, is optically measured through the rear surface of the transparent substrate.

9. The probe microscope device according to Claim 8, wherein the deformation or the vibration property of the cantilever is detected from the change in intensity of reflected light caused by optical interference which occurs between the cantilever and the transparent substrate.

10. The probe microscope device according to Claim 8, wherein the cantilever is irradiated to vibrate through the rear surface of the transparent substrate with light, the intensity of which varies at a frequency equal to a resonant frequency of the cantilever.

11. The probe microscope device according to Claim 8, wherein the cantilever is irradiated with light having a

constant intensity through the rear surface of the transparent substrate so as to generate self-excited vibration in the cantilever.